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185485

ATLAS
Final Report
July 18, 1992
Contract NAS8-36955 D.O. 136
Principal Investigator: M.J. Newchurch

Introduction

The purpose of this work supporting the ATLAS-2 mission scientist, Dr. Tim Miller at MSFC, was to provide scientific understanding of the stratospheric chemical measurements performed by the suite of ATLAS instruments. To accomplish this objective, the principal investigator developed a collaboration with Dr. Mark Allen at JPL to perform photochemical model studies of the stratosphere and continued a collaboration with Dr. Derek Cunnold at Georgia Tech to study SAGE and Dobson Umkehr ozone measurements. This effort resulted in one conference presentation and two journal submissions.

JPL Model

The JPL model is a 1-dimensional, time-dependent photochemical model with exhaustive photochemical treatment, spherical geometry, and accurate radiative transfer [Froidevaux et al., 1985]. This model has been used to investigate trace constituents critical to stratospheric chemistry [Allen and Delitsky 1990, 1991]. These studies used measurements from the ATMOS instrument when it flew on the Space Lab-3 mission. The ATMOS instrument is now a part of the ATLAS payload.

The work on this contract has focused on studying the effect of initial model partitioning of chlorine on the resultant concentration of chlorine monoxide (ClO) a critical trace species in the ozone destruction mechanism. A good deal of the work in this initial year involved developing a working relationship with the appropriate scientists and developing a working knowledge of the model including the necessary computer hardware and software. The principal investigator is now operating the JPL model at MSFC and the scientific assessment of the chlorine partitioning is in progress.

SAGE and Umkehr analysis

One of the critical questions in the area of stratospheric ozone is the magnitude of the trend of ozone amounts. Two of the primary instruments for measuring trends are the orbiting Stratospheric Aerosol and Gas Experiment and the ground-based Dobson instruments. In collaboration with Dr. Derek Cunnold, the principal investigator performed extensive analysis of these data sets in an intercomparative study [Newchurch and Cunnold, 1992a,b.] This analysis was presented at the Quadrennial Ozone Symposium, a four-year gathering of the world's ozone scientists [Newchurch and Cunnold, 1992c.]. As a result of this meeting, the principal investigator formed an affiliation with a number of other scientists that are interested in collaborating on research of interest to the ATLAS program.

Conclusion

As a result of this contract, the principal investigator developed an ability to run the JPL 1-dimensional time-dependent photochemical model at MSFC and is currently investigating a critical scientific question concerning chlorine photochemistry. Additionally, he has conducted research into the relationship between two key ozone measurement instruments (SAGE and Dobson Umkehr). The

results of this research were presented at an international scientific symposium and have been submitted for publication.

References

- Allen, M.A., and M.L. Delitsky, Stratospheric NO, NO₂, and N₂O₅: A comparison of model results with Spacelab 3 Atmospheric Trace Molecule Spectroscopy measurements, *J. Geophys. Res.*, 95, 14,077-14,082, 1990.
- Allen, M.A., and M.L. Delitsky, Inferring the abundances of ClO and HO₂ from Spacelab 3 Atmospheric Trace Molecule Spectroscopy observations, *J. Geophys. Res.*, 96, 2913-2919, 1991.
- Froidevaux, L., M.A. Allen, and Y.U. Yung, A critical analysis of ClO and O₃ in the mid-latitude stratosphere, *J. Geophys. Res.*, 90, 12,999-13,029, 1985.
- Newchurch, M.J., and D.M. Cunnold, Aerosol effect on Umkehr ozone profiles using SAGE II measurements, submitted to *J. Geophys. Res.*, 1992a.
- Newchurch, M.J., and D.M. Cunnold, SAGE II-Umkehr ozone profile comparisons, submitted to *J. Geophys. Res.*, 1992b.
- Newchurch, M.J., and D.M. Cunnold, SAGE II-Umkehr case study of ozone differences and aerosol effects from October 1984 to April 1989, Quadrennial Ozone Symposium, Charlottesville, VA, June, 1992c.

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NASA National Aeronautical and Space Agency		Report Document Page		(A)	
1. Report No. — final		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle DEVELOP RESEARCH PLAN FOR USE OF ATLAS DATA		5. Report Due 08/07/92		6. Performing Organization Code	
		8. Performing Organization Report No. 136 final report		10. Work Unit No. 5-32734	
7. Author(s) Dr. Michael Newchurch		9. Performing Organization Name and Address UAH Research Institute RI E-47 Huntsville, AL 35899		11. Contract or Grant No. NAS8-36955, D.O. 136	
12. Sponsoring Agency Name and Address National Aeronautics and Space Administration Washington, D.C. 20546-001 Marshall Space Flight Center, AL 35812		13. Type of report and Period covered Final Technical Report 08/07/92		14. Sponsoring Agency Code	
		15. Supplementary Notes IN-46-CR 185485- 3P			
16. Abstract This contract study is devoted to performing atmospheric photochemical modelling research in conjunction with the ATLAS missions.					
17. Key Words (Suggested by Author(s)) ATLAS Photochemical modelling			18. Distribution Statement		
19. Security Class. (of this report) Unclassified		20. Security Class. (of this page) Unclassified		21. No. of pages 3	
				22. Price	